

## Game: triangulation

Scouts and Guides have just been teleported in an unknown world! All they have is a map, a compass... and a transceiver! Will they be able to meet again?

**Learning targets:** Get familiar with the use of transceivers - get familiar with the SSTV technique for exchanging images via radio - Learn the triangulation technique to identify your own position in a map.

### Material:

Hardware:

- PMR/CB and Android phone for each Scout/Guide couple
- PC/mobile phone and Internet connection for video conferencing (if meeting altogether is not allowed)
- Map with rigid support
- Compass
- Optionally, a goniometer.
- pencil, rubber.

Software:

- Robot36  
(<https://play.google.com/store/apps/details?id=xdsopl.robot36&hl=it&gl=US>)
- SSTV encoder  
(<https://play.google.com/store/apps/details?id=om.sstvencoder&hl=it&gl=US>)

**Time and preferred place:** 2-3 hours. This is an outdoor activity (city/village), possibly in places where a wide sight of the landscape is available (no cities with high buildings and narrow streets).

**Description:** Scouts/Guides are divided into couples. Each person in the couple goes (or is taken, blindfolded to make things more difficult) in a place where it is possible to spot relevant elements of the landscape that may be identifiable on a map. The person measures the azimuth (the angle in clockwise sense between the north and that object, as seen from his/her point of view) of these objects (not less than 2) and transmits them to the other person of the couple. Each person in the couple must identify the position of the other one using the triangulation technique: if the other person sees a hill at  $20^\circ$  N, then that hill must be identified on the map and a line at  $180^\circ + 20^\circ = 200^\circ$  N must be drawn departing from the

hill; that's indeed the azimuth with which the hill would see that person. If azimuth angles greater than  $180^{\circ}$ N are reported, then calculate  $180^{\circ}$ -azimuth. After this operation was done for at least 2 objects, the lines should intersect in one point: that's the position of the other person! Using this technique, the two people must meet together, take a photo of themselves and send it via radio to the base. The exchange of images is performed in SSTV. The radio and the mobile phone are put close together in a sufficiently silent place; with the app Robot 36 it is possible to decode sound messages into images, while the SSTV encoder transforms an image into a sound, to be transmitted by radio. It's forbidden to call each other by phone, or use geolocalization apps such as Google Maps.

Possible alternative: scout/guide leaders transmit the position of some places that must be identified and reached by Scouts/Guides. Once in the place, a photo must be taken and sent via radio.